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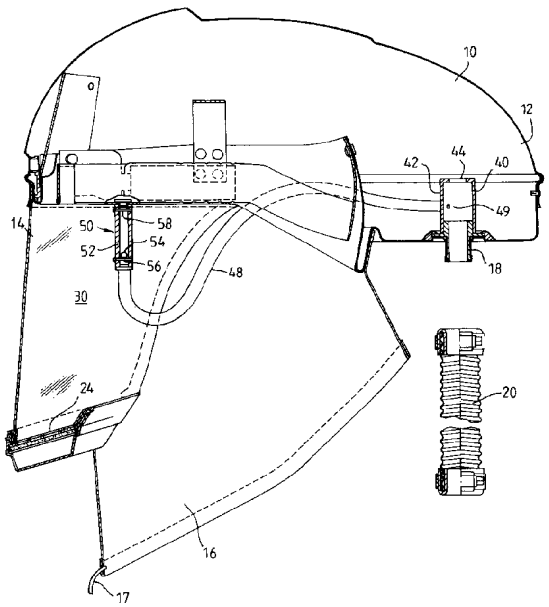
(54) Flow indicator.

(57) A low flow indicator for monitoring the flow of air or breathable gas to the breathing zone 30 of a respirator helmet 10. The flow indicator has a member 40 with a restricted orifice 44 through which all or part of the air or gas flows, so as to create a pressure differential across the orifice. A pressure sensing device 50 alerts the wearer of the respirator if the pressure differential falls below a predetermined value corresponding to a predetermined flow rate. The indicator can be calibrated by adjusting the size of the orifice 44. The pressure sensing device consists of a vertical tube 52 positioned in the breathing zone 30, open at its top and connected at its lower end to the orifice member 40, so that the pressure differential creates a flow of air or gas through the tube. A float 54, normally seated on a support 56 in the tube 52, is lifted off the support by the flow of air or gas as long as the pressure differential exceeds the predetermined value. The tube 52 is positioned in the field of view of the wearer, so that dropping of the float 54 gives a visual warning that the flow rate of gas or air to the respirator has fallen below the predetermined value. The float 54 may also operate an electrical switch 58 connected to a device 60 providing a visual or audible warning. Operation of the flow indicator is independent of the pressure inside the respirator, so that the indicator can be calibrated and tested before being fitted to the respirator.

Fig.2



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This invention relates to flow indicators. More particularly, the invention relates to a flow indicator for monitoring the flow of air or breathable gas supplied from an external supply to the breathing zone of a respirator.

The invention is concerned with respirators of the kind which are worn by personnel working in hazardous environments and which are provided with an external source of air or breathable gas. The respirators, which may be in the form of a hood or helmet, provide a breathing zone surrounding the wearer's mouth and nostrils. The flow of air or breathable gas to the breathing zone must be maintained at a level sufficient for respiration and also to ensure that, for example, gases or dust from the outside atmosphere are prevented from entering the breathing zone. It is therefore desirable to provide an indicator which monitors the rate of flow of air or breathable gas to the respirator and gives an immediate indication to the wearer if the rate of flow falls below a predetermined level.

This invention consists of a low flow indicator for monitoring the flow of air or breathable gas supplied from an external supply to the breathing zone of a respirator, comprising an orifice member having an orifice through which part or all of the air or gas flows before reaching the breathing zone, a pressure sensing device connected to the member so as to respond to the pressure differential created across the orifice by the flow of air or gas, and means for alerting the wearer of the respirator when the pressure sensing device senses that the pressure differential falls below a predetermined value.

Preferably, the pressure sensing device comprises a vertical tube positioned in the breathing zone, the tube being open at its upper end and connected at its lower end to the said member so that the pressure differential generated across the said orifice causes flow of air or gas through the tube, and a float housed within the tube and normally resting on a support within the tube, the float being arranged so that the flow of air through the tube when the pressure differential is above the predetermined value lifts the float from the support.

The indicator may be positioned in the field of vision of the wearer, so that the position of the float will give a visual indication to the wearer if the pressure differential falls below the predetermined value.

Alternatively, or in addition, the float may be arranged to operate an electrical switch, connected to a circuit operable to give a visual or audible signal if the pressure differential falls below the predetermined value.

Preferably, the cross-sectional area of the orifice is adjustable, to allow the device to be calibrated.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a cross-section through a respirator helmet provided with an indicator in accordance with this invention;

Figure 2 is a front view of the helmet; and

Figure 3 is a diagrammatic view of the flow indicator.

Referring to the drawings, a respirator helmet comprises a helmet shell adapted to fit over the crown of the head of the wearer and having a rearwardly extending portion 12. A visor 14 extends downwards from the front of the helmet shell 10, to define a breathing zone 30 around the face of the wearer. A skirt 16 of flexible material is connected to the helmet shell and visor and fits closely around the neck of the user, the lower rim of the skirt being provided with a drawstring 17. The rear portion 12 of the helmet shell 10 has an inlet 18 which, in use, is connected through a flexible hose 20 to a source of air or breathable gas, such as a compressed air bottle or a compressor, through a suitable pressure regulator. The helmet shell 10 is supported on the wearer's head by a suitable harness or cradle and is shaped to provide a passage over the crown of the wearer's head to the breathing zone 30, so that air supplied to the inlet 18 flows to the breathing zone. The air or gas exits from the breathing space through vents 24 in the lower part of the visor 14.

The respirator is provided with a low flow indicator, comprising a member 40 providing a restrictive orifice through which air is supplied to the interior of the helmet, and a pressure sensor 50 connected to the member 40 through a flexible tube 48. The member 40 consists of a short cylinder 42, connected at its lower end to the inlet 18 and having at its upper end an orifice 44 through which the air flows into the interior of the helmet shell. The orifice 44 has an area less than the cross-sectional area of the cylinder 42, so that the flow of air through the orifice creates a pressure differential across the orifice. The flexible tube 48 is connected at one end to a branch opening into the side wall of the cylinder 42 through a small aperture 49.

The pressure sensor 50 consists of a cylinder 52 mounted in the breathing zone 30 of the helmet. The cylinder 52 is connected at its lower end to the flexible tube 48, and is open at its upper end. The tube contains a spherical float 54, of diameter slightly less than the inside diameter of the cylinder 52, so that the float 54 can move freely in the cylinder. The lower and upper limits of movement of the float are defined by pins 56 and 58 near the lower end and upper end of the cylinder.

In use, the pressure differential across the orifice 44 generated by air flow through the member 40 produces an increased pressure inside the member 40. Part of the airflow is diverted to the pressure sensor 50 through the flexible tube 48, which transmits the increased pressure in member 40 to the lower end of the cylinder 52. The airflow through the cylinder

52, if it is above a predetermined value, lifts the float 54 off the lower pin 56 and holds it in contact with the upper pin 58. The position of the float therefore gives an indication as to whether the rate of flow of air into the interior of the helmet is above or below a predetermined value.

The predetermined value is set by the cross-sectional area of the orifice 44. The orifice may be made adjustable, so that the flow indicator can be calibrated before it is fitted to the helmet.

The pressure sensor 50 may be mounted in the helmet so that it is within the view of the wearer of the helmet, so that the movement of the float 54 from its upper position will give a visual indication that the rate of flow of air has fallen below the predetermined value. In addition, or alternatively, the pressure sensor may be arranged to operate an electrical circuit to provide an audible or visual warning. For example, as illustrated diagrammatically in Figure 3, the float 54 may be made of, or coated with, an electrically conductive material, and the upper pin 58 may be provided as two half-pins the ends of which are separated by a gap which is bridged by the float 54 when it is in its uppermost position. The half-pins form electrical terminals which are connected to an electrical circuit 60 which operates an audible warning device 62. The circuit 60 is arranged so that the warning device 62 is disabled as long as the circuit including the half-pins 58 is closed by contact with the float 54, and is energised to provide an audible warning if the float 54 moves away from the half-pins.

The flow indicator of the present invention has the advantage that its operation is independent of the pressure inside the helmet, and depends only on the rate of flow of air or breathable gas supplied to the helmet. The flow indicator can therefore be calibrated and tested before being fitted to the helmet.

Claims

1. A low flow indicator for monitoring the flow of air or breathable gas supplied from an external supply to the breathing zone of a respirator, comprising an orifice member having an orifice through which part or all of the air or gas flows before reaching the breathing zone, a pressure sensing device connected to the orifice member so as to respond to the pressure differential created across the orifice by the flow of air or gas, and means for alerting the wearer of the respirator when the pressure sensing device senses that the pressure differential falls below a predetermined value.

2. A low flow indicator as claimed in Claim 1, in which the pressure sensing device comprises a vertical tube positioned in the breathing zone, the tube being open at its upper end and connected at its lower end to the orifice member so that the pressure differential generated across the said orifice causes flow of air or gas through the tube, and a float housed within the tube and normally resting on a support within the tube, the float being arranged so that the flow or air or gas through the tube when the pressure differential is above the predetermined value lifts the float from the support.

3. A low flow indicator as claimed in Claim 2, in which the pressure sensing device is positioned in the field of vision of the wearer, so that the position of the float will give a visual indication to the wearer if the pressure differential falls below the predetermined value.

4. A low flow indicator as claimed in Claim 2 or Claim 3, in which the float is arranged to operate an electrical switch, connected to a circuit operable to give a visual or audible signal if the pressure differential falls below the predetermined value.

5. A low flow indicator as claimed in any one of claims 1 to 4 in which there are provided means for adjusting the cross-sectional area of the said orifice.

6. A respirator provided with a low flow indicator as claimed in any one of Claims 1 to 4.

Fig.1

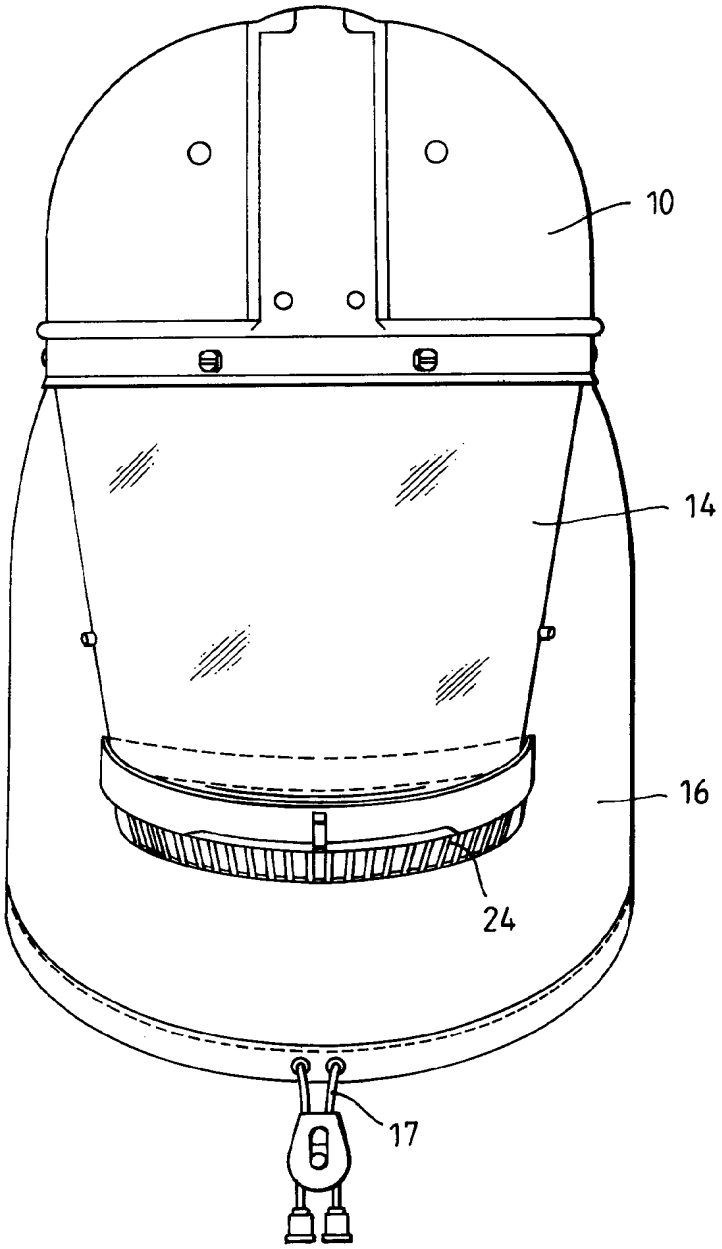


Fig. 2

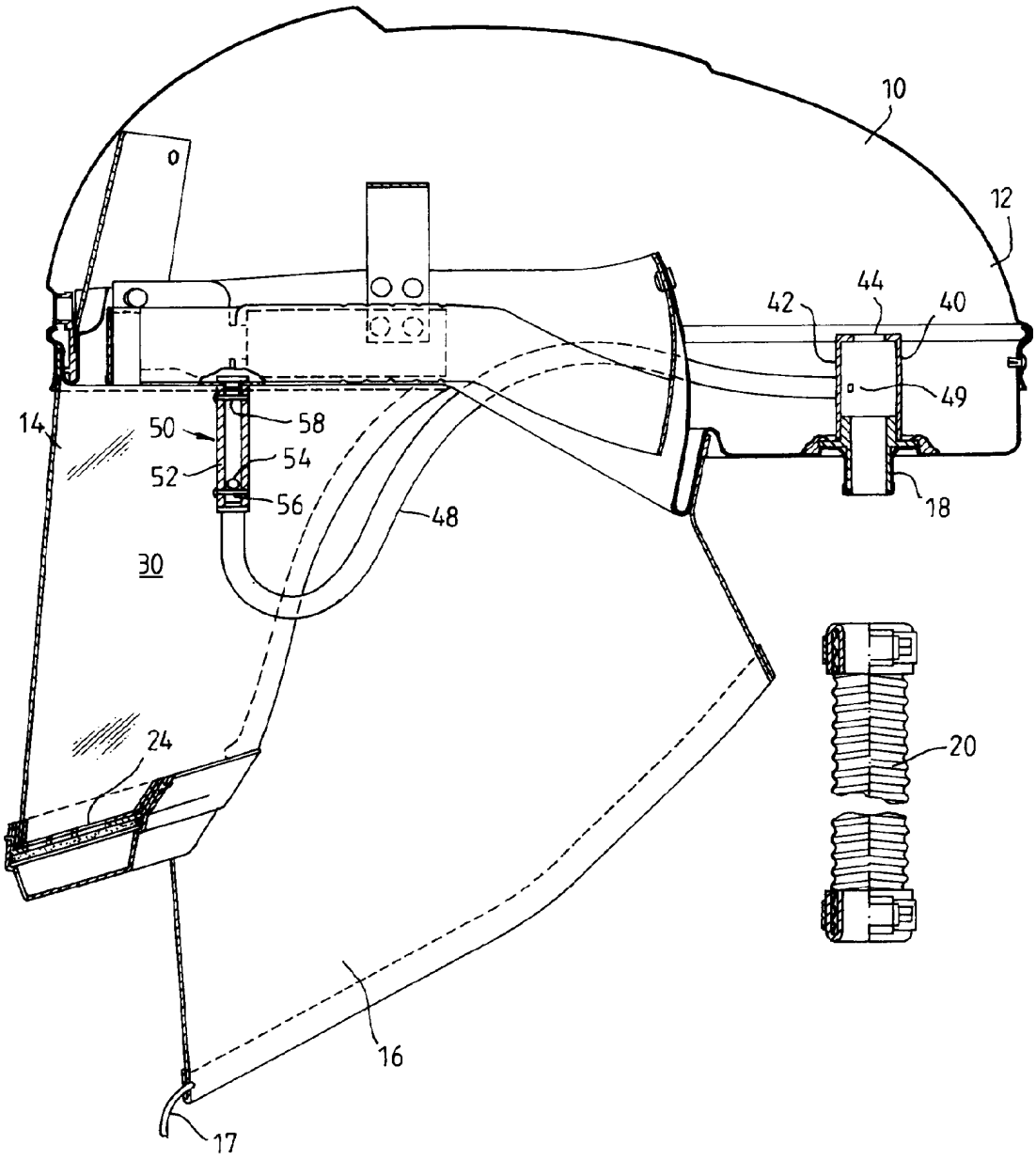
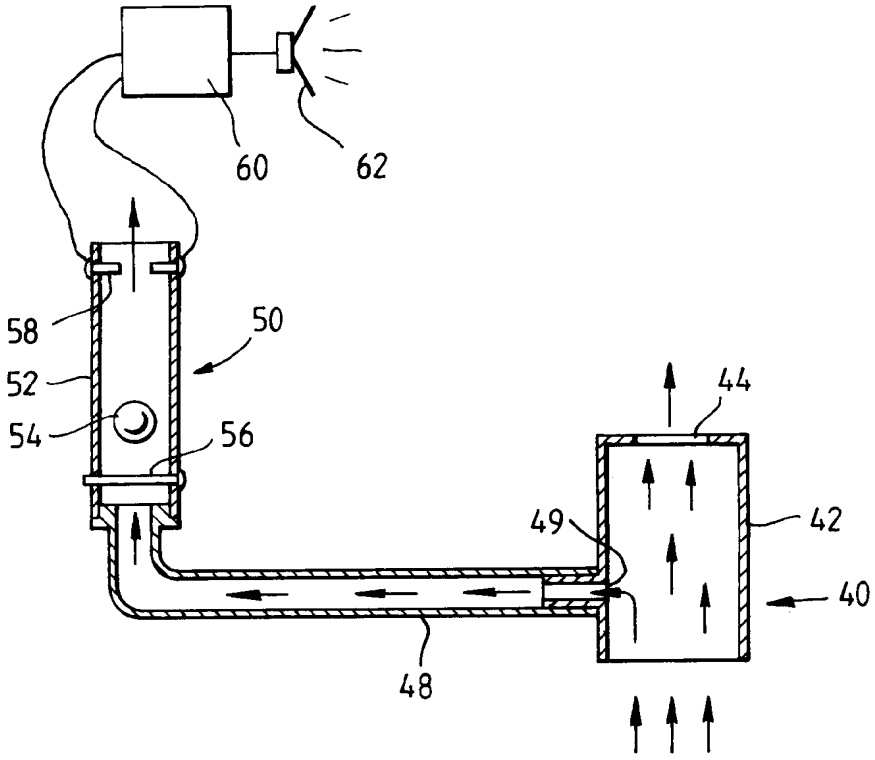


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 93 30 9652

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X Y	FR-A-594 676 (SOCIÉTÉ ANONYME DES ÉTABLISSEMENTS "AÉRA") * the whole document * ---	1 2-4,6	A62B9/00 A62B18/08
Y A	GB-A-2 130 893 (NATIONAL RESEARCH DEVELOPMENT CORPORATION) * the whole document * ---	2-4,6 1	
Y	GB-A-2 225 958 (SENTRY SAFETY LTD) * the whole document * -----	4,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

A62B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 February 1994	Triantaphillou, P

CATEGORY OF CITED DOCUMENTS

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